

# Research Summary

## Safety Evaluation of the Diverging Diamond Interchanges in Missouri

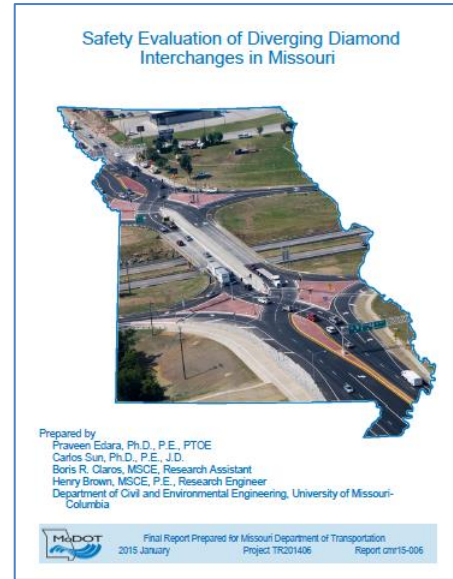
The Diverging Diamond Interchange (DDI) has gained in popularity in the United States during the last decade. The operational benefits and lower costs of retrofitting a conventional diamond with a DDI have contributed to its increased use. Existing research on DDIs has focused primarily on the assessment of operational benefits. Unfortunately, formal safety evaluations of DDIs have been lacking.

This study filled the knowledge gap by examining data from six DDI sites in Missouri to conduct a before-after safety evaluation at the project level (interchange) and the site-specific level (ramp terminals) of the DDIs using three methods: Naïve, Empirical Bayes (EB), and Comparison Group (CG).

The three evaluation methods that were used involved different trade-offs, such as data requirements, complexity, and regression-to-the-mean.

The safety evaluation at the project level accounts for the influence of the DDI treatment in the entire footprint of the interchange. On the other hand, the site-specific approach focused on the influence at the ramp terminals only.

All three methods showed that a DDI replacing a conventional diamond decreased crash frequency for all severities.



At the project level, the highest crash reduction was observed for fatal and injury (FI) crashes: 63.2% (Naïve), 62.6% (EB), and 60.6% (CG). Property damage only crashes were reduced by 33.9% (Naïve), 35.1% (EB), and 49.0% (CG). Total crash frequency also decreased by 41.7% (Naïve), 40.8% (EB), and 52.9% (CG).

Similarly, in the site-specific analysis, the highest crash reduction was observed for fatal and injury (FI) crashes: 64.3% (Naïve), 67.8% (EB), and 67.7% (CG). Property damage only crashes were reduced by 35.6% (Naïve), 53.4% (EB), and 47.0% (CG). Total crash frequency also decreased by 43.2% (Naïve), 56.6% (EB), and 53.3% (CG).

A collision type analysis revealed that the DDI, when compared to a diamond, traded high severity for lower severity crashes. While 34.3% of ramp terminal-related FI crashes in a diamond occurred due to the left turn angle crashes with oncoming traffic, the DDI eliminated this crash type.

In summary, the DDI offers significant crash reduction benefits over conventional diamond interchanges.



*The safety effectiveness results for the individual sites also demonstrated that fatal and injury (FI), property damage only (PDO), and total (TOT) crashes decreased at most sites after DDI implementation.*



Aerial view of DDI at RT-13 and I-44, Springfield, MO



Aerial view of DDI at US 65 and MO 248, Branson, MO



Aerial view of DDI at I-435 and Front Street, Kansas City, MO

## ***Project Information***

**PROJECT NAME:** Safety Evaluation of the Diverging Diamond Interchanges in Missouri

**PROJECT START/END DATE:** July 2013 through January 2015

**PROJECT COST:** \$60,001

**LEAD CONTRACTOR:** University of Missouri-Columbia

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